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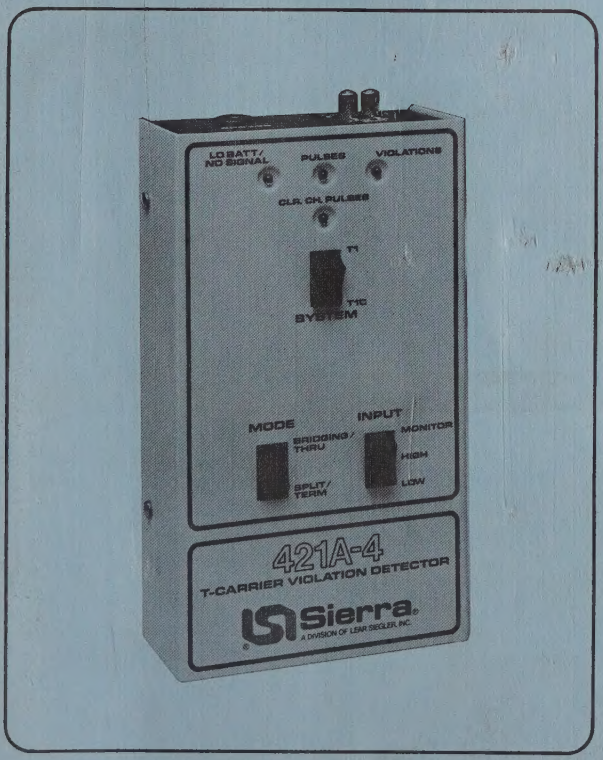
LER, INC.
CTRONIC DIVISION

SOM-421A-4
ISSUE 1
JUNE 15, 1984

421A-4

T-CARRIER VIOLATION DETECTOR

OPERATION MANUAL



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Sierra®
A DIVISION OF LEAR SIEGLER, INC.

LEAR SIEGLER, INC.
SIERRA ELECTRONIC
DIVISION

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Fig. 1-1
LSI/Sierra 421A-4
T-Carrier Violation Detector

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1. GENERAL

1.01 The 421A-4 T-Carrier Violation Detector, shown in Fig. 1-1, is a miniature test set which checks for presence of pulses and errors (bipolar violations) anywhere on the T1 or T1C PCM Line.

1.02 In the central office the 421A-4 can be connected directly to a Monitor, In or Out jack at the DSX or repeater bay or it can be bridged across the line at the MDF. In the line splitting mode, the line can be terminated at the MDF while maintaining the power loop. This feature permits sectionalizing a problem within the central office or on the span line. The 421A-4 can be used to bridge at any accessible point on the span line (either high level or low level). Some typical applications of the set are shown in Fig. 1-2.

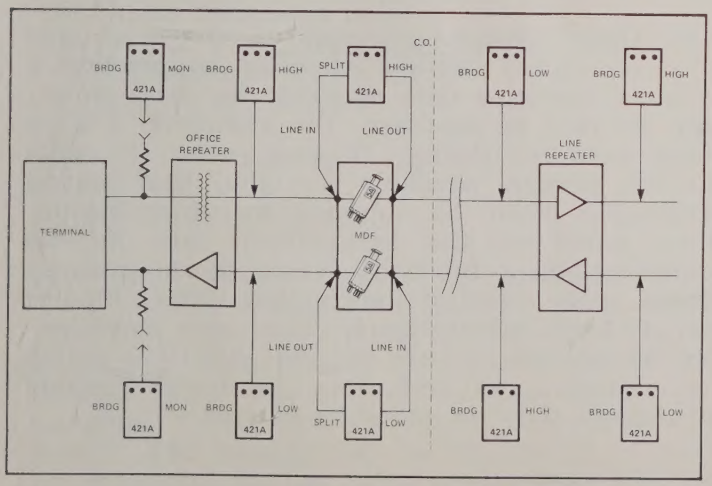

Fig. 1-2
Model 421A-4 Applications

1.03 The set is equipped with four LED indicators for displaying VIOLATIONS, PULSES, CLR.CH. (CLEAR CHANNEL) PULSES, and NO SIGNAL on the line. The Input/Output line jacks each accommodate a miniature plug and test cord (not supplied). Insertion of a plug into the LINE IN jack powers the set on. During operation, at least one indicator is always illuminated giving positive assurance that the set is powered and operating. Three switches, SYSTEM, MODE and INPUT, permit selection of the test circuits to be used. A built-in beeper sounds when errors (bipolar violations) are detected.

1.04 Powered by a self-contained, rechargeable Ni-Cad battery, the 421A-4 may be operated for a minimum of four hours on a full charge. An external battery charger is supplied with the test set and is capable of providing a full charge overnight.

1.05 Clear Channel Capability. It is a goal of digital service networks to provide a 64 kb/s customer data channel. In many cases, only 56 kb/s is supplied, the additional 8 kb/s being used for timing, framing, etc. To make the full channel available for data, this control information must be supplied by other means. When parts of the transmitted data include sequences of 8 or more zeros, these are replaced with coded strings called B8ZS (Bipolar with 8 Zero Substitution). This code intentionally introduces planned bipolar violations which are detected as defining the clear channel capability; they do not show as errors.

2. OPERATION

RECEIVING INFORMATION

2.01 Carefully unpack the T-Carrier Violation Detector test set, inspect for possible shipping damage, and check the shipping container's contents against the shipper invoice to determine completeness of delivery. (It is suggested that the shipping container and packing material be retained for instrument storage.) In the event any damage is discovered, either to the test set or accessory equipment, or should the order be found incomplete, or if the test set does not operate properly, contact the Sierra Customer Service Department:

Customer Service Department
Lear Siegler, Inc.
Sierra Electronic Division
3885 Bohannon Drive
Menlo Park, California 94025
Telephone: (415) 321-5374
TWX: 910-373-1282

POWER REQUIREMENTS

2.02 The 421A-4 power is provided by a rechargeable NiCad battery pack which, when fully charged, is capable of operating the instrument continuously for a minimum of four hours. When the battery voltage drops to a marginal level, the LO BATT indicator will flash. The battery may be charged in 14 hours by simply using the factory supplied, 115 VAC

external battery charger. If needed, the test set may be operated during charging.

> NOTE: For maximum battery performance, the 421A-4 test set should be turned off within a reasonable time from the low battery indication to avoid a completely discharged condition. Excessive battery charging is not recommended when the test set is not in use; also short discharge/recharge cycles should be avoided.

BATTERY CHARGING

2.03 To charge the NiCad battery pack, proceed as follows:

Step 1.

Remove all plugs (powers set off) from test set.

Step 2.

Connect charger to jack on top of 421A-4 case.

Step 3.

Connect external charger to 117 VAC power line. (The LO BATT/NO SIGNAL indicator will illuminate showing that the battery is being charged.)

Step 4.

Allow approximately 14 hours for a full charge. Do not charge the battery when the temperature is below 5°C (41°F) or above 45°C (113°F).

Step 5.

After 14 hours, disconnect charger from 421A-4 and power line.

OPERATIONAL CHECK

2.04 To perform the operational check, insert a plug in the LINE IN jack with no signal applied to the 421A-4 test set and observe the NO SIGNAL indicator illuminate.

> NOTE: When a plug is inserted in the LINE IN jack, at least one of the four indicators is always illuminated. This assures the operator that the instrument is powered and functional.

DETAILED OPERATING INSTRUCTIONS

Central Office Monitoring

2.05 Monitoring in the Central Office at the DSX or Office Repeater bay is accomplished as follows: (Refer to Fig.2-1).

Step 1.

Set MODE switch to BRIDGING/THRU.

Step 2.

Set INPUT switch to MONITOR.

Step 3.

Set SYSTEM switch to T1 or T1C as appropriate for type of PCM system under test.

Step 4.

Connect LINE IN jack of 421A-4 to equipment monitor jack using a shielded cord not longer than six feet.

Step 5.

Observe indicators for pulses and errors.

Central Office Terminated Measurements

2.06 Terminated line measurements in the Central Office are accomplished as follows: (Refer to Fig.2-1).

Step 1.

Set MODE switch to SPLIT/TERM.

Step 2.

Set INPUT switch to HIGH.

Step 3.

Set SYSTEM switch to T1 or T1C as appropriate for type of PCM system under test.

Step 4.

Connect LINE IN jack of 421A-4 to equipment Receive or Out jack using a shielded cord not longer than six feet.

Step 5.

Observe indicators for pulses and errors.

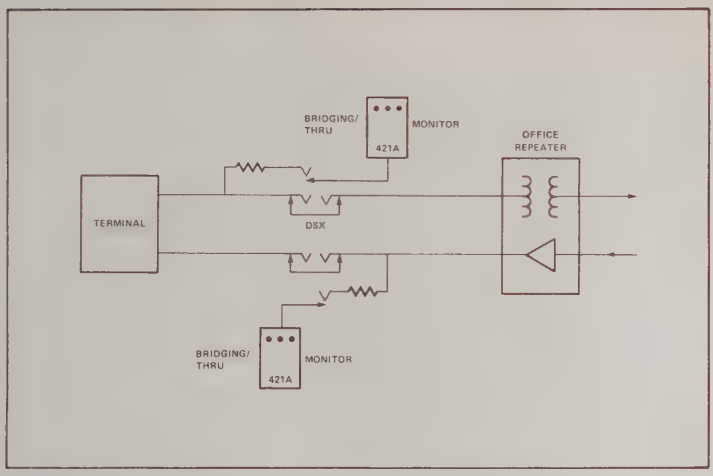

Fig. 2-1
Monitoring at the Central Office

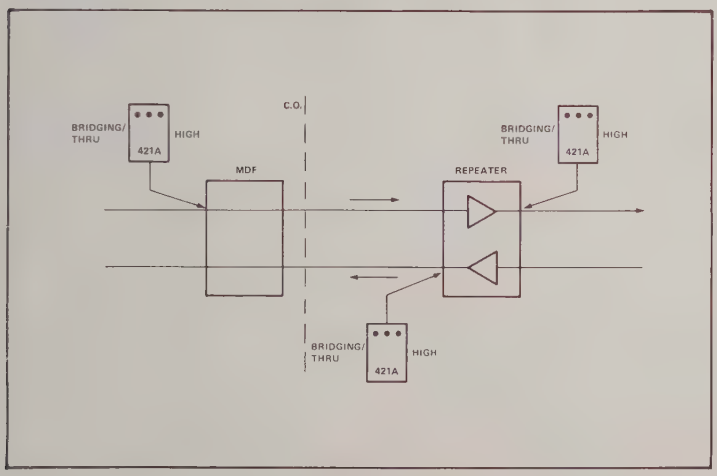

Fig. 2-2
Bridging Across Repeater or
other High Level Output

Repeater Output Bridging

2.07 Bridging across the line at the repeater output or at terminal output is accomplished as follows: (Refer to Fig. 2-2.)

Step 1.

Set MODE switch to BRIDGING/THRU.

Step 2.

Set INPUT switch to HIGH.

Step 3.

Set SYSTEM switch to T1 or T1C as appropriate for type of PCM system under test.

Step 4.
Connect LINE IN jack of 421A-4 to pair at output of repeater or terminal using a plug-to-alligator clip shielded test cord not longer than six feet.

Step 5.

Observe indicators for pulses and errors.

Repeater Input Bridging

2.08 Bridging across the line at repeater input or at the MDF input is accomplished as follows: (Refer to Fig. 2-3.)

Step 1.

Set MODE switch to BRIDGING/THRU.

Step 2.

Set INPUT switch to LOW.

Step 3.

Set SYSTEM switch to T1 or T1C as appropriate for type of PCM system under test.

Step 4.

Connect LINE IN jack of 421A-4 to pair at input of repeater or MDF using a plug-to-alligator clip shielded test cord not longer than six feet.

Step 5.

Observe indicators for pulses and errors.

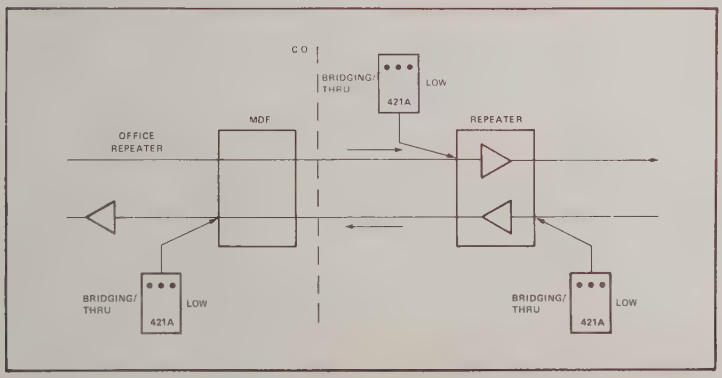

Fig. 2-3
Bridging Across Repeater Input

Transmit Problem Sectionalization

2.09 Sectionalizing a transmit problem by splitting the line at the MDF is accomplished as follows: (Refer to Fig. 2-4.)

CAUTION

Splitting the line at the MDF will interrupt service on the pair being tested. It is suggested that a working line be first patched off.

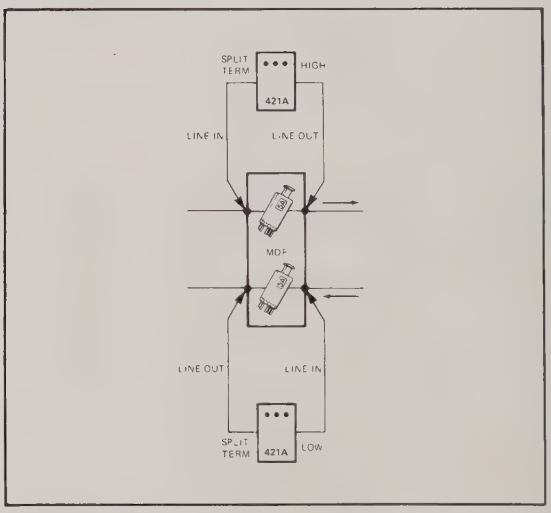

Fig. 2-4
Line Splitting at MDF

Step 1.

Set MODE switch to BRIDGING/THRU.

Step 2.

Set INPUT switch to HIGH.

Step 3.

Set SYSTEM switch to T1 or T1C as appropriate for type of PCM system under test.

Step 4.

Connect LINE IN jack of 421A-4 to office side of MDF protector block and connect LINE OUT jack to cable side.

Step 5.

Remove Heat Coils, Protector Module or HF-type frame jumpers of pair to be tested (open the pair).

Step 6.

If errors are indicated reset MODE switch to SPLIT/TERM. This terminates the transmit signal while maintaining the power loop through the test set.

> NOTE: If errors are still present, trouble is within the office. If the line is now error-free, trouble is on the span line. Sectionalizing can be continued at other accessible points within the office.

Receive Problem Sectionalization

2.10 Sectionalizing a receive problem by splitting the line at the MDF is accomplished as follows: (Refer to Fig. 2-4.)

Step 1.

Set MODE switch to BRIDGING/THRU.

Step 2.

Set INPUT switch to LOW.

Step 3.

Set SYSTEM switch to T1 or T1C as appropriate for type of PCM system under test.

Step 4.

Connect LINE IN jack of 421A-4 to cable side of MDF protector block and connect LINE OUT jack to office side.

Step 5.

Remove Heat Coils, Protector Module or HF-type frame jumpers of pair to be tested (open the pair).

Step 6.

If errors are indicated, reset MODE switch to SPLIT/TERM. This terminates the receive signal while maintaining the power loop through the test set.

> NOTE: If errors are still present, trouble is on the span line. If the line is now error-free, trouble is within the office. Sectionalizing can be continued at other accessible points on the PCM line.

3. PHYSICAL DESCRIPTION

3.01 The Model 421A-4 T-Carrier Violation Detector is housed in a metal case and is designed as a miniature portable test set. Individual light emitting diodes (LED) on the instrument's front panel display VIOLATIONS, PULSES, CLR.CH. (CLEAR CHANNEL) PULSES, and LO BATT/NO SIGNAL. The front panel has a SYSTEM switch to select the type of PCM system under test. A MODE switch and an INPUT switch are also located on the front panel.

3.02 Two miniature jacks are located on top of the instrument case, as is a jack for the battery charger. A clamp-mounted D-ring is provided on back of the instrument case for easy attachment to an equipment belt clip. A nickel-cadmium battery and a battery charger are supplied with the test set. A built-in beeper sounds when errors (bipolar violations) are detected.

CONTROLS AND INDICATORS

3.03 Location of controls and indicators is shown on Fig. 3-1, and they are identified in Table 3-1 along with a brief functional description.

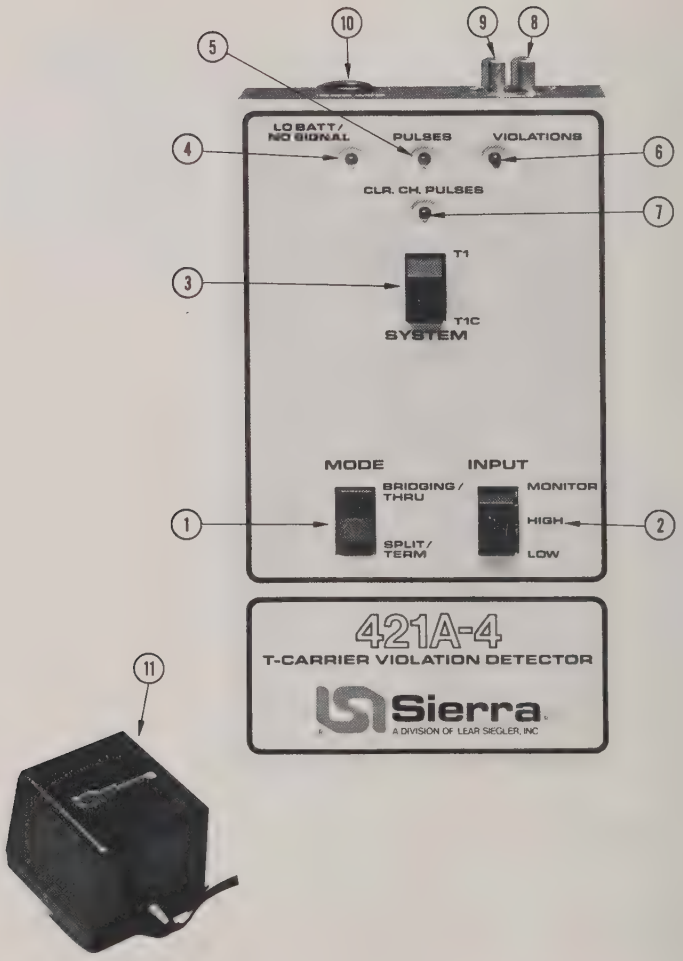

Fig. 3-1
Model 421A-4 Controls and Indicators

TABLE 3-1
CONTROLS AND INDICATORS

Item	Name	Function
1	MODE Switch	Selects testing method of test set: BRIDGING/THRU - bridges the line and connects IN to OUT SPLIT/TERM - terminates the line
2	INPUT Switch	Selects signal level: HIGH - output of repeater LOW - input to repeater MONITOR - office monitor jack.
3	SYSTEM Switch	Selects type of PCM system under test.
4	LO BATT/ NO SIGNAL Indicator	Illuminated when set is ON (by inserting a plug into LINE IN jack), in absence of valid signal. Flashes to indicate low battery and illuminates during charge.
5	PULSES Indicator	Illuminates to indicate standard AMI pulses.
6	VIOLATIONS Indicator	Flashes to show errors (bipolar violations).

table continued

TABLE 3-1
CONTROLS AND INDICATORS (continued)

Item	Name	Function
7	CLR.CH. (CLEAR CHANNEL) PULSES Indicator	Indicates when B8ZS codes are on line. (B8ZS = Bipolar with 8 Zero Substitution)
8	LINE IN Jack	Input jack for all tests. Insertion of test plug powers set on.
9	LINE OUT Jack	Output jack for THRU or SPLIT testing. Maintains power loop through set.
10	BAT. CHG. Jack	Mating jack for external battery charger.
11	Battery Charger	Recharges battery pack of test set.

4. SPECIFICATIONS

CONTROLS

SYSTEM Switch Positions:

T1	DS-1 input signal (1.544 Mb/s)
T1C	DS-1C input signal (3.152 Mb/s)

MODE Switch Positions:

BRIDGING/ THRU	Connects the set's LINE IN jack to the LINE OUT jack without termination; test set bridges the line.

SPLIT/TERM Provides 105-Ohm termination on LINE IN jack. Maintains power loop to LINE OUT jack.

INPUT Switch Positions:

MONITOR	Accepts monitor jack signal level (20 dB flat attenuation below high level). Includes internal 105-Ohm termination.
HIGH	Accepts high level signals (2 to 4 V base to peak).
LOW	Accepts low level signals (repeater output signal attenuated by the transmission system: 6 to 36 dB for T1 and 8 to 54 dB for T1C).

SPECIFICATIONS (continued)

INDICATORS

LO BATT/ NO SIGNAL	1) Indicates when no signal is detected (loss of signal). 2) Indicates when battery charger is connected. 3) Intensifies when no signal is detected with the battery charger connected. 4) Flashes when battery charge is low. (Test set will not operate with low battery.)
PULSES	Indicates detection of AMI coded pulses (does not include B8ZS codes).
VIOLATIONS	Indicates detection of errors (bipolar violations).
CLR. CH. (CLEAR CHANNEL) PULSES	Indicates detection of B8ZS codes (clear channel).

INPUT IMPEDANCE

Monitor Mode:	105 (±10) Ohms
Bridging Mode:	Greater than 1500 Ohms
Terminated/ Split Mode:	105 (±10) Ohms

SPECIFICATIONS (continued)

POWER REQUIREMENTS

Battery Pack:	9.6 V 225 mAmp-hr NiCad rechargable
Battery Charge Life:	5 hours nominal (4 hours minimum) on full charge at 20°C
Battery Charger:	External plug-in unit. 14 hours full charge

PHYSICAL CHARACTERISTICS

Case Dimensions:	6.8 in (17 cm)L x 3.9 in (10 cm)W x 1.8 in (5 cm)D
Weight:	20 oz (570 gm)
Operating Temperature:	0 to 50°C (32 to 122°F)

Fig. 4-1
Sierra 421A-4 with Some of the
Available Accessories

5. MAINTENANCE

5.01 Operational checks and battery charging comprise the only maintenance the operator is required to perform on this instrument.

5.02 Service and repair information is available by contacting the Sierra Customer Service Department. (Refer to Section 2.)

> NOTE: Contact Sierra Customer Service before returning the test set to the factory (whether under warranty or otherwise) for proper packing and shipping instructions.

5.03 In the event the LO BATT/NO SIGNAL indicator flashes under normal operating conditions, the battery should be recharged. (Refer to paragraph 2.03.) After recharge, when a plug is inserted in the LINE IN jack with no valid signal feeding into the test set, this indicator illuminates continuously.

5.04 Should the operator suspect that the set is malfunctioning, refer to Section 2. If the test set fails to operate in accordance with the instructions prescribed in Section 2, contact Sierra Customer Service.

CLEANING

5.05 The instrument can be cleaned with a soft damp cloth squeezed in a solution of 90% isopropyl alcohol and 10% water. Be careful not to moisten any wiring or electrical parts. Do not submerge the test set in the solution. Use a soft, dry, clean cloth to wipe dry after cleaning.

ACCESSORIES

Sierra P/N	Description
914400041	Adapter (with a miniature jack and a 310 plug)
914400050	Adapter (with a 310 jack and a miniature plug)
916400173	5-foot patch cord - miniature plug both ends
916400174	5-foot patch cord - miniature plug to 310 plug
916400179	5-foot patch cord - miniature plug to alligator clips
917300512	External battery charger
918500028	Battery Pack - 9.6V, 225 mAmp-hr
921000082	Canvas carrying case

— NOTES —

— NOTES —

WARRANTY

SIERRA ELECTRONIC DIVISION, LEAR SIEGLER, INC. warrants products manufactured by it to be free from defects in material and workmanship and to meet the applicable specifications under normal use and service for a period of 12 months from the date of original shipment by us. Our obligation under this warranty is limited to the repair or replacement of such products which, after having been returned to the factory or a point designated by us, shall be examined and in our sole opinion, found defective and that such defect was not induced by causes external to the product. Alternately, SIERRA may elect to issue credit for any such defective product. All products to be repaired or replaced shall be returned prepaid to the designated place of repair in accordance with authorization and packing and shipping instructions issued by SIERRA. Return shall not be made until such authorization and instructions are issued. Each returned product shall be accompanied by a statement or report fully stating the claimed defects and any other pertinent information concerning the failure.

SIERRA's responsibility under this warranty does not apply to any products which have been repaired, worked upon or altered by persons not authorized by us so as to in our sole judgement, injure the stability or reliability of such product, or which have been subject to misuse, negligence or accident, or where applicable, the serial number has been altered, effaced or removed. SIERRA shall not be liable for damages resulting from the use of the purchased product, nor shall SIERRA be responsible for any failure in the performance of other items to which the purchased product is connected or the functioning of an entire system or parts of any system of which the purchased product may be a part.

SIERRA reserves the right to make changes in the design or construction of any of its products at any time without incurring any obligation to make changes whatever on units previously purchased. Accessories, including but not limited to all vacuum tubes, fuses, pilot lamps and batteries used with our products are not covered by this warranty. A test setup charge of $100.00 will apply to any returned instrument or microwave component which, after test, is found to meet the applicable specifications.

This warranty is in lieu of all other warranties, expressed, implied or statutory. No representative or person is authorized to represent nor assume for SIERRA any liability in connection with the sale of products other than set forth herein. IN NO EVENT SHALL SIERRA BE LIABLE FOR SPECIAL INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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